

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 1-4, 6-8, 10-16 and 28 are in this case and have been rejected under § 103(a). No amendments to the claims are made at this time.

§ 103(a) Rejections

The Examiner has rejected claims 1-4, 6-8, 10-16 and 28 under § 103(a) as being unpatentable over Annis et al. (US 5786065) in view of Michaud (US 7037866). The Examiner's rejections are respectfully traversed.

While both Annis et al. and Michaud disclose techniques for forming non-woven abrasive cloth, the Applicant respectfully submits that the combination proposed by the Examiner fails to establish a prima facie basis for an obviousness rejection of the claimed invention for one or more of the following reasons:

- The references teach alternative solutions to the same problem such that a person having ordinary skill in the art would consider it redundant and unnecessary to combine them.
- The references teach away from the combination.
- The proposed combination is inherently incompatible and would be either inoperative or at least inferior.

Each of these arguments will now be presented in more detail.

By way of introduction, the present invention and both of the cited references address the problem of how to impart abrasive properties to a surface of a non-woven cloth formed from flexible fibers. In order to achieve the desired abrasive properties, the surface of the cloth must provide some type of hard "lumps" on or at the surface.

Annis et al. provides the required “lumps” by transforming the properties of individual fibers near the surface of the cloth while Michaud provides “lumps” by stiffening a surface topology of the cloth.

Annis et al., discussed at length in the specification on page 2, lines 4-20 and page 8, lines 11-22, discloses a technique for forming an abrasive non-woven cloth using a wet-laid web containing thermoplastic fibers which then form abrasive nodules under heat treatment.

In order to ensure an effective abrasive surface, Annis et al. achieves an increased concentration of the thermoplastic fibers at one surface of the web. This is done by the use of a wet-laid web forming process in which the low density thermoplastic fibers inherently tend to float to the surface (col. 6, lines 6-12). The use of a wet-laid web forming process, as well as the need for the fibers to be able to float upwards, imposes limitations on the length of fibers which can be used. Thus, Annis et al. discloses the use of thermoplastic fibers with lengths of 5-15 millimeters (see col. 4, line 64, col. 6, line 13 and Table 1). It is emphasized that longer fibers, particularly at small denier, are problematic since they may not disperse properly in the aqueous slurry (col. 6, lines 18-21).

Michaud on the other hand discloses a production process for assembling an abrasive cloth from two water-entangled layers sandwiching a spunbond layer. Water-entanglement is used to bond the layers of the cloth and generate an embossed pattern with “dimples” on one surface. The dimples are then rendered stiff by spraying with a binder composition to impart them with abrasive properties.

In order to facilitate the water-entanglement embossing step, the layers of water-entangled web are formed from staple fibers of between 4 and 20 centimeters (40-200 millimeters).

The Examiner has stated that Annis et al. teaches the invention as claimed except that Annis et al. does not teach water entanglement to generate a pattern of raised and lowered regions, which is taught by Michaud. The Examiner has further stated that it would have been obvious to modify the process of Annis et al. in view of Michaud, i.e., to add the embossing step to the process of Annis et al.

In response, the Applicant wishes to point out the following points.

Redundancy of Teachings

As mentioned above, the desired abrasivity of the cloth requires formation of lumps at the surface. Annis et al. teaches one technique for achieving lumps, namely, formation of nodules by heat treatment of fibers, while Michaud teaches another, namely, stiffening of embossed dimples by use of a binder.

The Applicant respectfully submits that the Examiner has failed to identify, and certainly has not made explicit, any apparent line of reasoning to justify the proposed combination of the embossing of Michaud with the production process of Annis et al. In fact, the Applicant respectfully submits that the techniques are alternative approaches to solving the same problem, and that there would be no apparent reason to implement the combination proposed by the Examiner.

Teaching Away

Furthermore, the Applicant respectfully submits that Annis et al. explicitly teaches away from the suggested combination. Annis et al. repeatedly emphasizes that the abrasive surface should be planar. To quote:

In accordance with the present invention, there is provided a single layer, abrasive, nonwoven fibrous material having a first abrasive planar surface formed predominantly of substantially uniformly dispersed nodulated abrasive fiber remnants. In one embodiment according to the invention, the concentration of the abrasive fiber remnants decreases across the thickness of the web material from the abrasive planar surface to the opposite planar surface of the web. ...

*The material initially is formed as a nonabrasive precursor nonwoven fibrous web material having on one **planar** surface a substantially uniform distribution of attenuated, meltable or thermoplastic fibers. The precursor sheet is heated sufficiently to cause the attenuated fibers to soften, compact or shrink, thereby forming nodules or, more specifically, nodulated fiber remnants that impart a roughened or abrasive characteristic to at least one **planar** surface of the resulting web material.* (col. 2, lines 49-67, emphasis added)

Thus, in a single paragraph, Annis et al. repeats on no less than four occasions the desired property that the abrasive surface should be planar. This emphasis appears again in col. 3, lines 32-53.

This insistence of Annis et al. upon use of a planar abrasive surface is not incidental. The abrasive effect achieved by the cloth of Annis et al. is a direct function of the number of nodules which come into contact with a surface against which the fiber is rubbed. This is the motivation for Annis et al. requiring a high concentration of the thermoplastic fibers at the surface of the web. The modification proposed by the Examiner, namely, to induce embossed undulations in the abrasive surface, would inherently greatly reduce the number of nodules which would come into contact with a rubbed surface, thereby undermining the explicit intent of Annis et al. to maximize the contact of nodules at the surface.

In view of both the explicit emphasis of planarity in the text and the logical underpinning of this requirement, it seems clear that the modification of Annis et al. by addition of embossing as proposed by the Examiner is contrary to the explicit teachings of Annis et al. The Applicant therefore respectfully submits that the Examiner's rejections under § 103(a) are unjustified.

Incompatible Teachings – Inoperative or Inferior Combination

As detailed above, Annis et al. employs wet-laid web forming to achieve the required gradient of concentration of thermoplastic fibers through the thickness of the web. The equipment used for wet-lay web forming is inherently limited to relatively

short fiber lengths in order to avoid clogging of the nozzles through which the slurry passes. Furthermore, as explicitly discussed by Annis et al., the fiber lengths should be relatively short in order to allow the mobility of fibers required to form the desired concentration gradient. Thus, Annis et al. discloses the use of fibers in the 5-15 millimeter range.

The water entanglement embossing process taught by Michaud works by the jets of water causing migration of portions of the fibers into relatively large drainage holes in a sleeve or belt. Relatively long fibers must be used so that escape of the fibers through the drainage holes is prevented by the anchoring of the remainder of the length of the fibers within the body of the cloth. If the fibers are too short, they will not be effectively anchored in the cloth and instead of forming raised portions will simply be extracted from the cloth and flow with the water jets into the drainage holes. Thus, Michaud discloses the use of fibers in the range of 40-200 millimeters. The lower limit of 40 millimeters, well beyond the 5-15 millimeters of Annis et al., is a reasonable lower limit for the length of fibers which can be effectively embossed by water entanglement techniques.

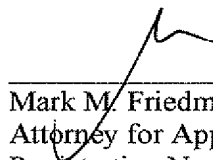
With this in mind, the Applicant respectfully submits that the combination proposed by the Examiner is either inoperative or, at the least, likely to lead to highly inferior results. Any attempt to implement embossing by water entanglement in the process as taught by Annis et al. would result in many fibers being lost through the drainage holes and little if any embossing effect. Any attempt to further modify Annis et al. by increasing the fiber lengths would encounter the problems of decreased mobility of the fibers mentioned by Annis et al., and would also be likely to clog the wet-lay nozzles. Any attempt to implement Annis et al. with a dry-laid web would fail to achieve a concentration of thermoplastic fibers at one surface, resulting in the

majority of the nodules being within the body of the cloth and failing to contribute to the abrasive properties.

For any and all of the above-stated reasons, the Applicant respectfully submits that the Examiner has failed to establish a prima facie case for obviousness of the claimed invention over the Annis et al. and Michaud references. Reconsideration of the Examiner's rejections under § 103(a) is respectfully requested.

In view of the above amendments and remarks it is respectfully submitted that independent claim 1, and hence also dependent claims 2-4, 6-8, 10-16, and 28, are in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,



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